CLAIMS

The invention claimed is:

1. A device comprising:

a main encoder for encoding a first portion of a data stream into first frames and a second portion of the data stream into second frames, the second portion following the first portion; and

a redundant encoder for encoding the first portion into first redundant frames that are delayed from the first frames according to a redundant-coding delay having a first value and the second portion into second redundant frames that are delayed from the second frames according to a redundant-coding delay having a second value different from the first value.

2. The device of claim 1, further comprising:

an adjustable delay for imparting the redundant-coding delay into the first and second redundant frames, the adjustable delay for controlling a value of the redundant-coding delay responsive to a control signal.

3. A device comprising:

a jitter buffer for receiving packets through a network; and

a processor coupled with the jitter buffer, wherein the processor is adapted to

determine at least one performance parameter of the network from the reception of the packets;

determine an ideal value of a redundant encoding delay from the performance parameter;

encode the ideal value in the feedback signal; and

transmit the feedback signal through the network.

4. The device of claim 3, wherein

the performance parameter is a return redundant coding delay of frames contained in the received packets.

5. The device of claim 3, wherein the processor is adapted to:

determine the ideal value from the performance parameter using one of a look up table and a polynomial curve fit.

6. The device of claim 3, wherein the processor is further adapted to:

determine a present value of a redundant-coding delay from the reception of the packets; and

determine an offset of the ideal value from the present value,

wherein the ideal value is encoded in the feedback signal only if the offset exceeds a threshold.

7. The device of claim 3, wherein the processor is adapted to determine the performance parameter by:

determining an episode length number of one of an episode of consecutively lost packets and an episode of consecutively received packets.

8. The device of claim 7, wherein the processor is further adapted to determine the performance parameter by

determining at least one of an average and a variance of the counted episode length number.

9. The device of claim 7, wherein

the episode length number is determined for an episode within a moving time window.

10. The device of claim 7, wherein the processor is further adapted to:

determine a time difference between consecutive episodes.

11. The device of claim 3, wherein the processor is adapted to determine the performance parameter by:

postulating a good state for no packets lost, a bad state for packets lost, and

counting a p number for transitions from one of the good state and the bad state to the other.

12. The device of claim 11, wherein the processor is further adapted to determine the performance parameter by:

determining a q number complementary to the p number, and

computing an average loss rate from the p number and the q number.

13. The device of claim 11, wherein

the p number is counted within a moving time window.

14. A device comprising:

means for inputting a present value for a redundant-coding delay;

means for encoding a first portion of a data stream into first frames;

means for redundantly encoding the first portion into first redundant frames that are delayed from the first packets according to the present value;

means for determining an updated value for the redundant-coding delay that is different from the present value;

means for encoding a second portion of the data stream into second frames, the second portion following the first portion; and

means for redundantly encoding the second portion into second redundant frames that are delayed from the second frames according to the updated value.

15. The device of claim 14, further comprising:

means for setting a minimum threshold for the redundant-coding delay, and

wherein the updated value for the redundant-coding delay is maintained not below the minimum.

16. The device of claim 14, further comprising:

means for setting a maximum threshold for the redundant-coding delay, and

wherein the updated value for the redundant-coding delay is maintained not above the maximum.

17. The device of claim 14, further comprising:

means for receiving a feedback signal through a network,

wherein the updated value is determined also from the feedback signal.

18. The device of claim 14, further comprising:

means for receiving a return stream of packets through a network; and

means for determining a return redundant coding delay of the return stream,

wherein the updated value is determined also from the return redundant coding delay.

19. The device of claim 14, further comprising:

means for determining at least one performance parameter of the network after encoding the first portion,

wherein the updated value is determined also from the performance parameter.

20. The device of claim 19, further comprising:

means for determining an ideal value of a redundant encoding delay from the performance parameter.

21. The device of claim 19, wherein the means for determining the performance parameter includes

means for determining an episode length number of one of an episode of consecutively lost packets and an episode of consecutively received packets.

22. The device of claim 21, wherein the means for determining the performance parameter further includes

means for determining at least one of an average and a variance of the counted episode length number.

23. The device of claim 21, wherein

the episode length number is determined for an episode within a moving time window.

24. The device of claim 21, further comprising:

means for determining a time difference between consecutive episodes.

25. A device comprising:

means for receiving packets through a network;

means for determining at least one performance parameter of the network from the reception of the packets;

means for determining an ideal value of a redundant encoding delay from the performance parameter;

means for encoding the ideal value in the feedback signal; and

means for transmitting the feedback signal through the network.

26. The device of claim 25, wherein

the performance parameter is a return redundant coding delay of frames contained in the received packets.

27. The device of claim 25, wherein

the ideal value is determined from the performance parameter using one of a look up table and a polynomial curve fit.

28. The device of claim 25, further comprising:

means for determining a present value of a redundant-coding delay from the reception of the packets; and

means for determining an offset of the ideal value from the present value,

wherein the ideal value is encoded in the feedback signal only if the offset exceeds a threshold.

29. The device of claim 28 wherein

the offset is computed as a fraction of

a difference between the ideal value and the present value

over one of the ideal value and the present value.

30. The device of claim 25, wherein the means for determining the performance parameter includes

means for determining an episode length number of one of an episode of consecutively lost packets and an episode of consecutively received packets.

31. The device of claim 30, wherein the means for determining the performance parameter further includes

means for determining at least one of an average and a variance of the counted episode length number.

32. The device of claim 30, wherein

the episode length number is determined for an episode within a moving time window.

33. The device of claim 30, further comprising:

means for determining a time difference between consecutive episodes.

34. The device of claim 25, wherein the means for determining the performance parameter includes

means for postulating a good state for no packets lost, a bad state for packets lost, and

means for counting a p number for transitions from one of the good state and the bad state to the other.

35. The device of claim 34, wherein the means for determining the performance parameter further includes

means for determining a q number complementary to the p number, and

means for computing an average loss rate from the p number and the q number.

36. The device of claim 34, wherein

the p number is counted within a moving time window.

37. An article comprising: a storage medium, the storage medium having instructions stored thereon, wherein when the instructions are executed by at least one device, they result in:

inputting a present value for a redundant-coding delay;

encoding a first portion of a data stream into first frames;

redundantly encoding the first portion into first redundant frames that are delayed from the first frames according to the present value;

determining an updated value for the redundant-coding delay that is different from the present value;

encoding a second portion of the data stream into second frames, the second portion following the first portion; and

redundantly encoding the second portion into second redundant frames that are delayed from the second frames according to the updated value.

38. The article of claim 37, wherein the instructions further result in:

setting a minimum threshold for the redundant-coding delay, and

wherein the updated value for the redundant-coding delay is maintained not below the minimum.

39. The article of claim 37, wherein the instructions further result in:

setting a maximum threshold for the redundant-coding delay, and

wherein the updated value for the redundant-coding delay is maintained not above the maximum.

40. The article of claim 37, wherein the instructions further result in:

receiving a feedback signal through a network,

wherein the updated value is determined also from the feedback signal.

41. The article of claim 37, wherein the instructions further result in:

receiving a return stream of packets through a network; and

determining a return redundant coding delay of the return stream,

wherein the updated value is determined also from the return redundant coding delay.

42. The article of claim 37, wherein the instructions further result in:

determining at least one performance parameter of the network after encoding the first portion,

wherein the updated value is determined also from the performance parameter.

43. The article of claim 42, wherein the instructions further result in:

determining an ideal value of a redundant encoding delay from the performance parameter.

44. The article of claim 42, wherein determining the performance parameter includes

determining an episode length number of one of an episode of consecutively lost packets and an episode of consecutively received packets.

45. The article of claim 44, wherein determining the performance parameter further includes

determining at least one of an average and a variance of the counted episode length number.

46. The article of claim 44, wherein

the episode length number is determined for an episode within a moving time window.

47. The article of claim 44, wherein the instructions further result in:

determining a time difference between consecutive episodes.

48. An article comprising: a storage medium, the storage medium having instructions stored thereon, wherein when the instructions are executed by at least one device, they result in:

receiving packets through a network;

determining at least one performance parameter of the network from the reception of the packets;

determining an ideal value of a redundant encoding delay from the performance parameter;

encoding the ideal value in the feedback signal; and

transmitting the feedback signal through the network.

49. The article of claim 48, wherein

the performance parameter is a return redundant coding delay of frames contained in the received packets.

50. The article of claim 48, wherein

the ideal value is determined from the performance parameter using one of a look up table and a polynomial curve fit.

51. The article of claim 48, wherein the instructions further result in:

determining a present value of a redundant-coding delay from the reception of the packets; and

determining an offset of the ideal value from the present value,

wherein the ideal value is encoded in the feedback signal only if the offset exceeds a threshold.

52. The article of claim 51, wherein

the offset is computed as a fraction of

a difference between the ideal value and the present value

over one of the ideal value and the present value.

53. The article of claim 48, wherein determining the performance parameter includes

determining an episode length number of one of an episode of consecutively lost packets and an episode of consecutively received packets.

54. The article of claim 53, wherein determining the performance parameter further includes

determining at least one of an average and a variance of the counted episode length number.

55. The article of claim 53, wherein

the episode length number is determined for an episode within a moving time window.

56. The article of claim 53, wherein the instructions further result in:

determining a time difference between consecutive episodes.

57. The article of claim 48, wherein determining the performance parameter includes

postulating a good state for no packets lost, a bad state for packets lost, and

counting a p number for transitions from one of the good state and the bad state to the other.

58. The article of claim 57, wherein determining the performance parameter further includes

determining a q number complementary to the p number, and

computing an average loss rate from the p number and the q number.

59. The article of claim 57, wherein

the p number is counted within a moving time window.

60. A method comprising:

inputting a present value for a redundant-coding delay;

encoding a first portion of a data stream into first frames;

redundantly encoding the first portion into first redundant frames that are delayed from the first frames according to the present value;

determining an updated value for the redundant-coding delay that is different from the present value;

encoding a second portion of the data stream into second frames, the second portion following the first portion; and

redundantly encoding the second portion into second redundant frames that are delayed from the second frames according to the updated value.

61. The method of claim 60, further comprising:

setting a minimum threshold for the redundant-coding delay, and

wherein the updated value for the redundant-coding delay is maintained not below the minimum.

62. The method of claim 60, further comprising:

setting a maximum threshold for the redundant-coding delay, and

wherein the updated value for the redundant-coding delay is maintained not above the maximum.

63. The method of claim 60, further comprising:
receiving a feedback signal through a network,
wherein the updated value is determined also from the feedback signal.

64. The method of claim 60, further comprising:
receiving a return stream of packets through a network; and
determining a return redundant coding delay of the return stream,
wherein the updated value is determined also from the return redundant coding delay.

65. The method of claim 60, further comprising:
determining at least one performance parameter of the network after encoding the first portion,
wherein the updated value is determined also from the performance parameter.

66. The method of claim 65, further comprising:
determining an ideal value of a redundant encoding delay from the performance parameter.

67. The method of claim 65, wherein determining the performance parameter includes
determining an episode length number of one of an episode of consecutively lost packets and an episode of consecutively received packets.

68. The method of claim 67, wherein determining the performance parameter further includes
determining at least one of an average and a variance of the counted episode length number.

69. The method of claim 67, wherein

the episode length number is determined for an episode within a moving time window.

70. The method of claim 67, further comprising:
determining a time difference between consecutive episodes.

71. A method comprising:
receiving packets through a network;
determining at least one performance parameter of the network from the reception of the packets;
determining an ideal value of a redundant encoding delay from the performance parameter;
encoding the ideal value in the feedback signal; and
transmitting the feedback signal through the network.

72. The method of claim 71, wherein
the performance parameter is a return redundant coding delay of frames contained in the received packets.

73. The method of claim 71, wherein
the ideal value is determined from the performance parameter using one of a look up table and a polynomial curve fit.

74. The method of claim 71, further comprising:
determining a present value of a redundant-coding delay from the reception of the packets; and
determining an offset of the ideal value from the present value,
wherein the ideal value is encoded in the feedback signal only if the offset exceeds a threshold.

75. The method of claim 74, wherein
the offset is computed as a fraction of
a difference between the ideal value and the present value
over one of the ideal value and the present value.

76. The method of claim 71, wherein determining the performance parameter includes

determining an episode length number of one of an episode of consecutively lost packets and an episode of consecutively received packets.

77. The method of claim 76, wherein determining the performance parameter further includes

determining at least one of an average and a variance of the counted episode length number.

78. The method of claim 76, wherein

the episode length number is determined for an episode within a moving time window.

79. The method of claim 76, further comprising:

determining a time difference between consecutive episodes.

80. The method of claim 71, wherein determining the performance parameter includes

postulating a good state for no packets lost, a bad state for packets lost, and

counting a p number for transitions from one of the good state and the bad state to the other.

81. The method of claim 80, wherein determining the performance parameter further includes

determining a q number complementary to the p number, and

computing an average loss rate from the p number and the q number.

82. The method of claim 80, wherein

the p number is counted within a moving time window.